COCOON-SPINNING THYSANOPTERA

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Among recent findings arising from studies of thrips, there is one of particular interest from the standpoint of the phylogeny of the order Thysanoptera. This fact is the discovery of the cocoon-spinning capacity. Kurdjumov (1913) was the first to report this habit, as observed in the larva of *Æolothrips fasciatus* (L.) in Russia. Secondly, unaware of Kurdjumov's finding, Reijne (1919-20) described the same habit in *Franklinothrips tenuicornis* Hood in Dutch Guiana (Paramaribo). Lastly, Karny (1926) described the same characteristic in an *Anaphothrips* species in Java (Buitenzorg).

In the spring of 1932 at Alhambra, California, the writer reared *Æolothrips kuwanaii* Moulton in the laboratory and discovered that it spins a cocoon for pupation. This observation is the first report of this habit among thrips in North America. Since this first observation, the writer has reared *Æolothrips fasciatus* (L.) and has confirmed Kurdjumov's finding. These two species have spun their cocoons in curled leaves of alfalfa in vials in the laboratory. In both instances the "silk" came from the anal end of the body and the cocoons were formed by the twisting and turning of the abdomen. The cocoons are not uniform in shape, but usually oval. The "silk" itself varies in diameter.

In addition to these species, three others, in two different æolothripid genera have a similar habit, namely, *Orothrips kelloggii* Moulton, *Ankothrips yuccæ* Moulton, and *Ankothrips gracilis* Moulton. All these species secreted the "silk" from the anus* and formed their cocoons in soil in vials in the laboratory. The cocoons have not yet been found in the field as considerable time and patience is necessary to locate them.

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*Snodgrass (1938) states "the Malpighian tubules of certain insects are known to produce just before the time of pupation a substance which is spun out of the anus in the form of silk threads, with which the cocoon is woven. This silk-forming function of the larval Malpighian tubules has been described in the neuropterous species *Mermeleon formicarius* and *Chrysopa perla*, in the curculionid *Phytonomus arator*, and in the chalcid *Euplectrus bicolor*." This is apparently the case also in these thrips.

In the spring and early summer in California, æolothripids are very abundant and by midsummer they have largely disappeared. Only occasionally is a specimen of *Æolothrips* collected during the hot, dry period. However at higher elevations they are to be seen during July and August. *Orothrips*, *Ankothrips*, and *Erythrothrips* in California have only one generation a year and, as far as is known to the writer at present, are all plant feeders. In view of the fact that *Æolothrips fasciatus* and *kuwanaii* (both of which are predaceous) are present over a longer period, it would seem probable that they have two generations (Kurdjumov found two generations in *fasciatus*). Insufficient observations have been made on *Dactuliothrips* (their larvæ have not thus far been collected) to make any definite statement, although the members of this genus almost certainly have the same type of life history as the other æolothripids in this area. *Melanthrips* does not occur in North America. European records of this latter genus do not mention the pupal stage; the pupa of the very common *M. fuscus* (Sulzer) is unknown. The collection dates, however, indicate that the seasonal history of *Melanthrips* (and *Rhipidothrips*) species is the same as *Æolothrips*. Biological data concerning the members of the fourteen other æolothripid genera are unknown.

In the Thripoidea and related groups of Terebrantia the genus *Anaphothrips* is the only one reported up to this time to exhibit the cocoon-spinning capacity. The species mentioned by Karny is unknown and to the writer's knowledge the generic identification was not based on adults. During the spring of 1939 the writer reared large numbers of a *Heterothrips* collected from wild grape flowers, which spun cocoons. This species has only one generation a year. The well-known pear thrips, *Tæniothrips inconsequens* (Uzel), has a life history (one generation a year) similar to the æolothripid genera *Ankothrips*, *Orothrips*, etc.—at least those known in California. It is to be noted that the larva of *T. inconsequens* (while not spinning a cocoon) forms an earthen cell with the tip of the abdomen. From intensive collecting and field observations, it is surmised that *Odontothrips loti* (Hal.) and *Oligothrips oreios* Moulton, each with one annual generation only, either spin cocoons or form a protective cell in the soil beneath their hosts.

When the above-mentioned species (with the exception of *Anaphothrips*) are examined one is impressed by the fact that they all have tarsal or tibial hooks, or projections on the head or antennæ. This is also true of *Merothrips* species concerning which no life history data are available.

From these observations, incomplete as they are, it would appear that the Terebrantia (or at least certain known species which spin a cocoon or form an earthen cell) have developed (or retained) hooks or other anterior projections. These projections doubtless are used in aiding the adult to emerge and are not to be confused with the raptorial function. Also, a generalization which appears to be indicated by these facts is that the cocoon-spinning capacity is a characteristic of the æolothripids and has been retained by certain thripoid representatives which have one generation annually. As further biological data is obtained on additional species and new forms are described, the relationship of the higher groups of the Terebrantia may become more evident.

References

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NOTES ON SOME CICINDELIDÆ

(Coleoptera)

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Since the appearance of the description of *Cicindela willistoni* subsp. *amargosæ* Dahl[1], several specimens of this form have been collected far from the type locality. It seems desirable at this time to record this increase in range as well as to sepa-

[1]Dahl, R. G., 1939, Bull. Brook. Ent. Soc., 34 : 221-222.